

Utah State University

DigitalCommons@USU

Fall Student Research Symposium 2020

Fall Student Research Symposium

12-10-2020

Mitochondrial Pyruvate Consumption Decreases Glycolytic Flux in Postmortem Muscle

Natalie Keele

Utah State University, keelenatalie5@gmail.com

Follow this and additional works at: <https://digitalcommons.usu.edu/fsrs2020>



Part of the [Nutrition Commons](#)

Recommended Citation

Keele, Natalie, "Mitochondrial Pyruvate Consumption Decreases Glycolytic Flux in Postmortem Muscle" (2020). *Fall Student Research Symposium 2020*. 33.

<https://digitalcommons.usu.edu/fsrs2020/33>

This Book is brought to you for free and open access by the Fall Student Research Symposium at DigitalCommons@USU. It has been accepted for inclusion in Fall Student Research Symposium 2020 by an authorized administrator of DigitalCommons@USU. For more information, please contact digitalcommons@usu.edu.



Mitochondrial pyruvate consumption decreases glycolytic flux in postmortem muscle

Natalie Keele, Jared Buhler, David Dang, Chandler Stafford, Sulaiman Matarneh

Department of Nutrition, Dietetics and Food Sciences, Utah State University, Logan, United States



Introduction

- Color, water-holding capacity, and tenderness are important aspects of meat quality that are impacted by pH
- pH of meat is primarily determined by the amount of anaerobic glycolysis that occurs postmortem
- Glycogen degradation produces ATP, pyruvate and hydrogen ions that acidify the meat impacting meat quality
- During an absence of oxygen, pyruvate is converted to lactate to restore NAD⁺ necessary for further glycolysis
- In anoxia, mitochondrial enzymes continue to function and may compete for pyruvate, causing decreased lactate and NAD⁺ production
- This competition may limit glycolytic flux, in turn slowing down pH decline

Purpose

The purpose of this study was to determine the impact that mitochondria have on pH decline in meat

Hypothesis

We hypothesized that inhibition of pyruvate dehydrogenase and pyruvate carboxylase would increase the rate of glycolysis

Materials & Methods

- We used pre-rigor pork muscle tissue which was added to an *in vitro* system that mimics postmortem metabolism
- Treatment tubes included inhibitors of two key mitochondrial enzymes involved in pyruvate metabolism, where one tube contained CPI-613 which inhibits pyruvate dehydrogenase, another contained avidin which inhibits pyruvate carboxylase and another contained both CPI-613 and avidin
- Each tube was analyzed for pH, glycogen, lactate, glucose, and Glucose-6-Phosphate (G6P)

Results

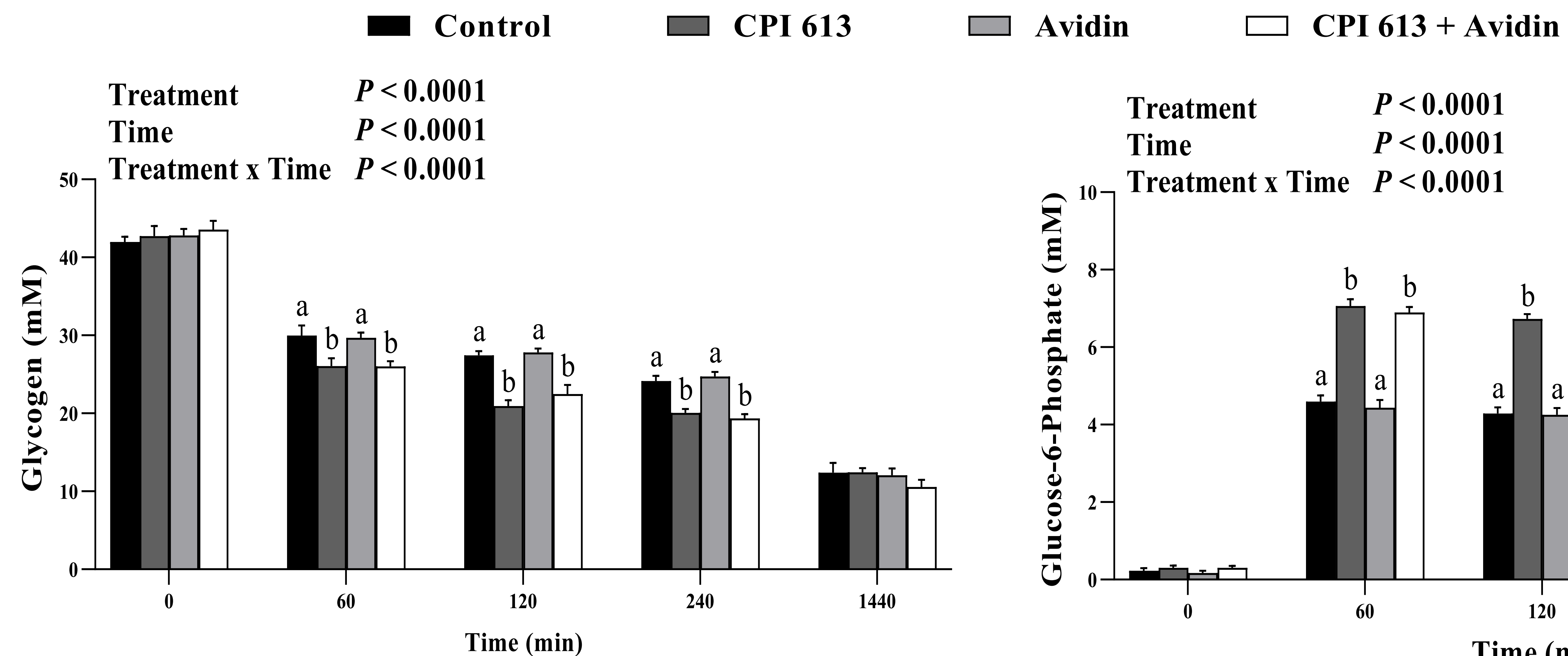


Fig.1 Glycogen (mM) of control and treatment pork samples at 0, 60, 120, 240, and 1440 min. Data are least-squares means \pm SE. ^{a-b}Means lacking a common letter differ significantly ($P \leq 0.05$).

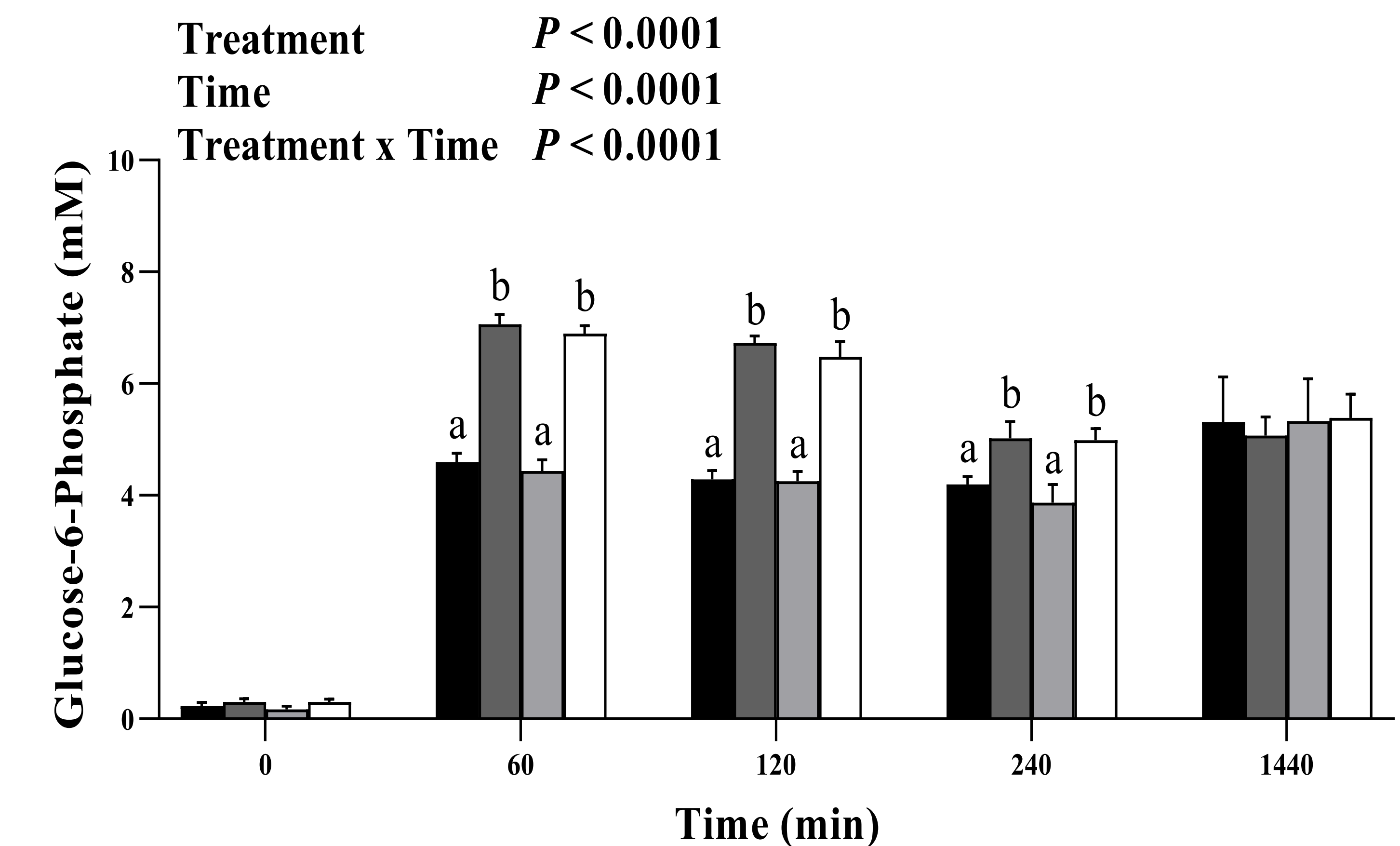


Fig.2 G6P (mM) of control and treatment pork samples at 0, 60, 120, 240, and 1440 min. Data are least-squares means \pm SE. ^{a-b}Means lacking a common letter differ significantly ($P \leq 0.05$).

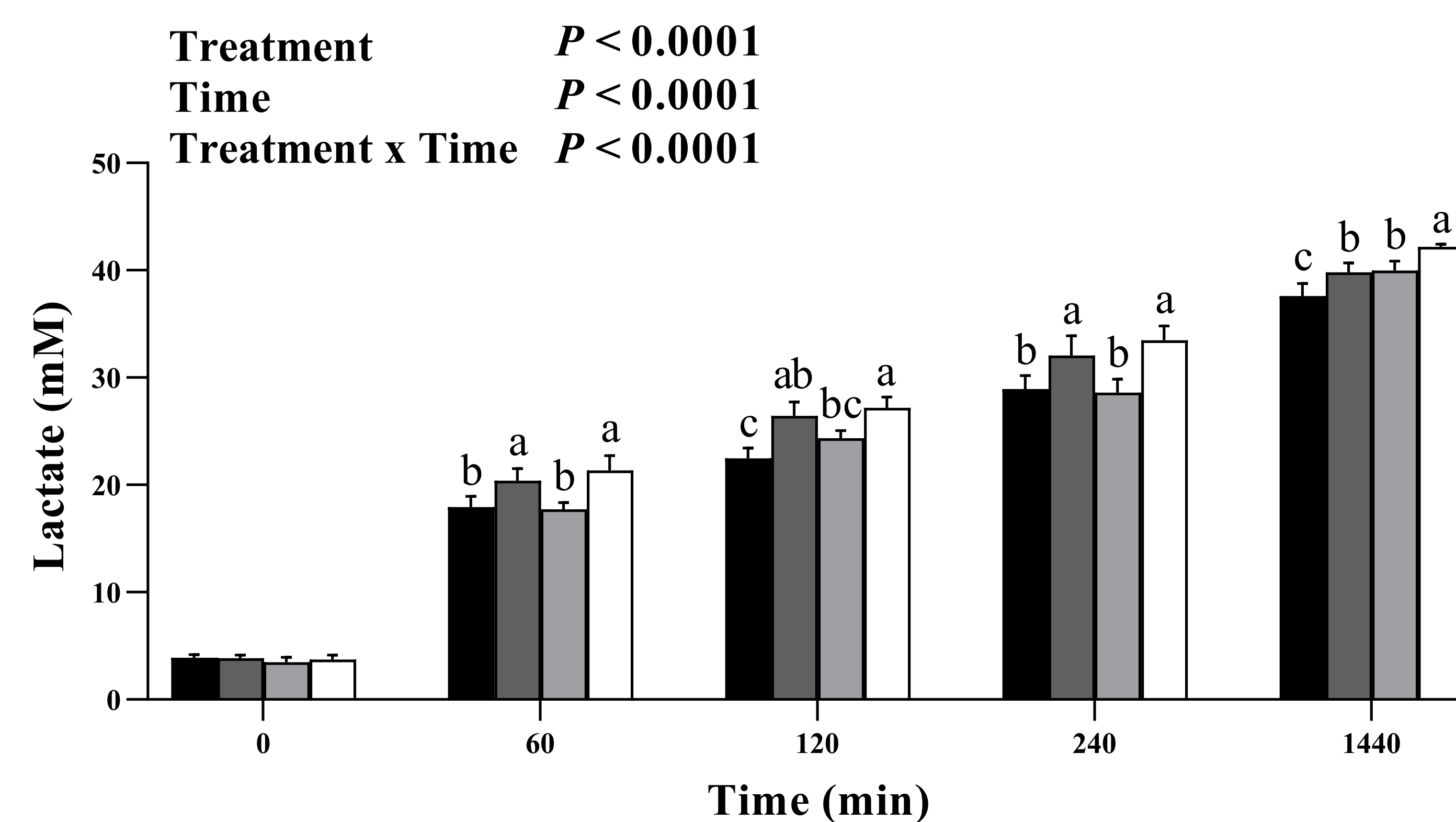


Fig.3 Lactate (mM) of control and treatment pork samples at 0, 60, 120, 240, and 1440 min. Data are least-squares means \pm SE. ^{a-c}Means lacking a common letter differ significantly ($P \leq 0.05$).

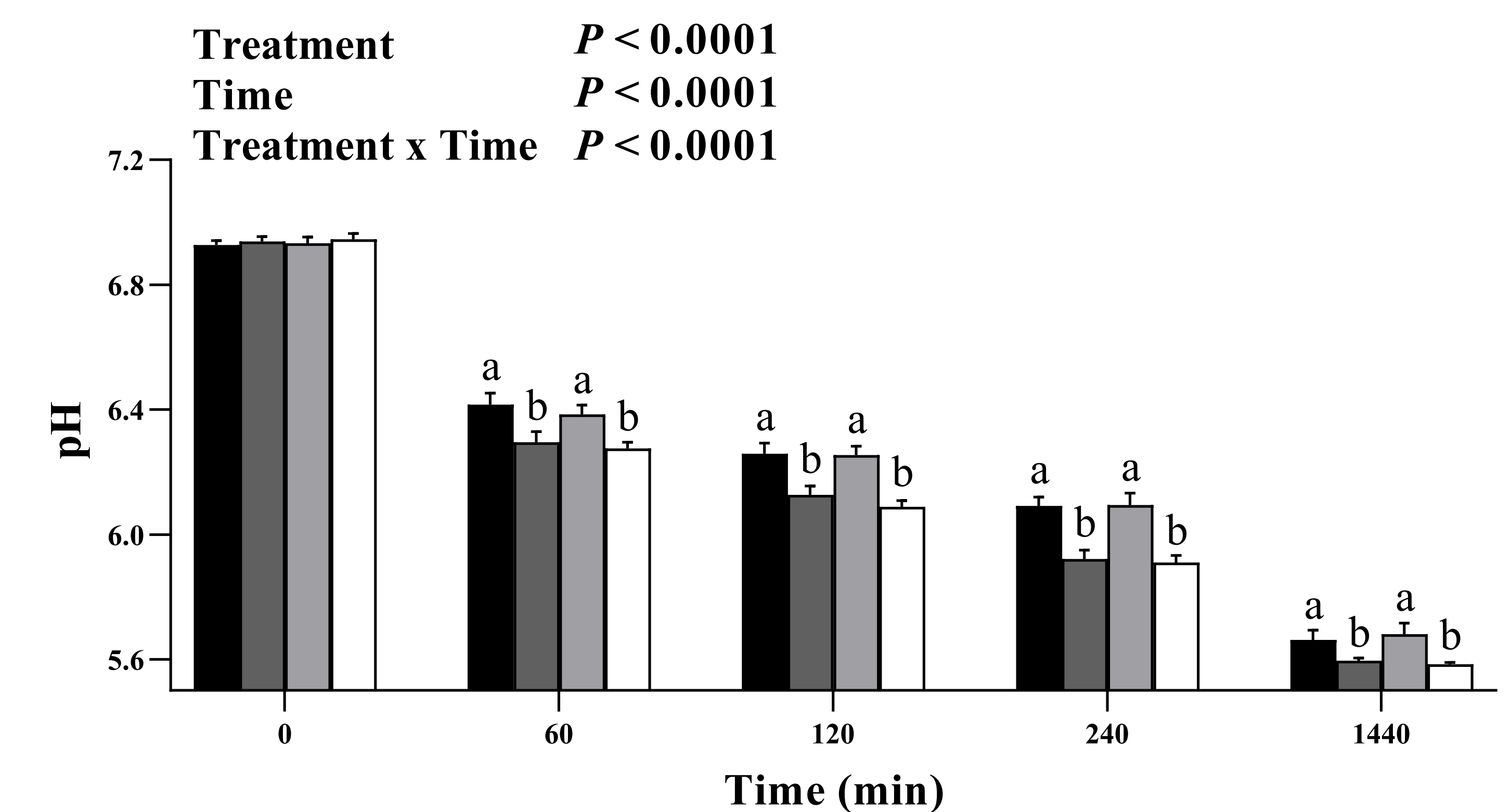


Fig.4 pH of control and treatment pork samples at 0, 60, 120, 240, and 1440 min. Data are least-squares means \pm SE. ^{a-b}Means lacking a common letter differ significantly ($P \leq 0.05$).

Conclusion

This data suggests that inhibition of pyruvate dehydrogenase increases the rate of glycolysis in meat and mitochondria may play a role in modulating postmortem glycolysis

Acknowledgment

The authors would like to thank Haden Davis and Abigail Esco for their contributions to this study. Also, for the USDA for funding this study.